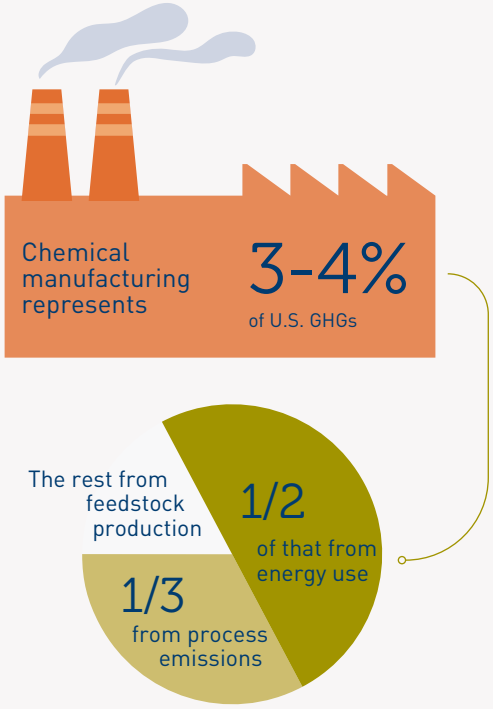
Policy Recommendations for a **Lower Emissions Future**

ACC Members are Taking Action to Fight Climate Change:

American® Chemistry Council

- Working to reduce emissions & improve emissions intensity of our own operations
- Reporting GHG & Energy Efficiency performance since 2005
- Collaborating to identify, develop and deploy technologies that will enable a lower emissions chemical industry in the future
- Supporting a phase down of HFCs, which can be tens of thousands of times more potent as a greenhouse gas than CO_2
- Welcoming the U.S. recommitment to the Paris Climate Agreement
- A growing number of chemical companies have stated goals, ambitions, or commitments to reduce GHG emissions

Meeting America's climate goals will require public & private sector collaboration, technology breakthroughs, significant investment, sustained commitment & nationwide policies.



To support climate progress ACC calls on Congress to enact legislation to:

- Increase government investment & scientific resources to develop & deploy low emissions technologies in the manufacturing sector
- Adopt transparent, predictable, technology- & revenue-neutral, market-based, economy-wide carbon price signals
- Encourage adoption of emissions-avoiding solutions & technologies throughout the economy to achieve significant emissions savings

U.S. Chemical Manufacturing is Part of the Solution to a Lower-Emissions, Economically Strong Future

$565 Billion U.S. industry

25% of U.S. GDP supported by the business of chemistry

544,000 High skill, high paying jobs

25% Higher wages than average manufacturing jobs

Touches **96%** of manufactured goods including the technologies needed to meet America's Climate Goals

Safety & Health

Energy-Saving Building Materials

Low Emissions Transportation

Clean Energy

Modern Infrastructure

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POINT ONE: Increase government investment & scientific resources to develop & deploy lower emissions technologies in the manufacturing sector

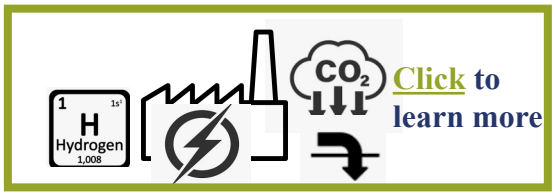
ACC members are helping to enable a lower-emissions future. This transition will require a fundamental transformation of chemical manufacturing processes and factories. Success will require the brightest minds in industry, academia and government; billions in public and private investment; decades of innovation and change; and sustained collaboration between government and industry.

Affordable domestic natural gas has made the U.S. the global destination of choice for chemical manufacturers, driving billions of dollars in expansion and new plants since 2010. Natural gas and natural gas liquids are now the primary feedstock, or raw material, used in the U.S. to create thousands of chemical products. Natural gas provides power, and today is the only adequate source of the heat that chemical plants need to operate.

Many ACC members are exploring alternatives like bio-based and recycled feedstocks, new low or no-emissions energy sources and possible electrification of chemical manufacturing processes. However, adoption of some of these alternatives are decades away.

Multiple new technologies & game-changing breakthroughs will be needed for lower emissions manufacturing:

- Low- or no-emissions sources of electricity including **new nuclear energy** sources and **expanded renewable energy generation**
- Reliable domestic supply chains for **Advanced Batteries**
- **Direct Air Capture**, to "suck" CO2 out of the air
- **Advanced recycling** to capture value from plastic waste and create recycled raw materials for use in some chemical production
- **Cost effective energy efficiency improvements**
- Availability of globally competitive, **bio-based alternatives** such as green methanol and ethylene



Transforming s**team cracking** will be essential for a lower emissions chemical sector**. Steam cracking is** the energy intensive process that produces the vast majority of materials used by the chemical industry and needed to create products other segments of the manufacturing sector demand. Numerous options are in development including:

- Developing and deploying new **lower- or no-emissions sources of heat, such as hydrogen**, at existing plants
- Greater Utilization of **combined heat and power** Systems
- **Carbon capture, storage and utilization** to capture emissions from plant operations
- New technology to improve **process efficiency** and maximize process yields
- **Electrification of steam crackers**, which could revolutionize chemical manufacturing in the decades to come

Congress can help enable a lower emissions future for American manufacturers:

- Facilitate public-private collaborations, especially with U.S. National Labs, to overcome barriers to low emissions industrial technologies
- Establish a technology-neutral incentive for production of low carbon hydrogen
- Temporarily extend and expand Section 48C clean energy manufacturing tax credit and ensure it includes a broad range of technologies, including those that are nascent.
- Help develop domestic supply chains for battery storage and hydrogen-based technologies
- Increase the value of the Section 45Q tax credit for Carbon Capture Utilization and Storage, extend the start of construction date to 2031, and lower the volume threshold
- Lift the 20-MW cap on federal combined heat and power (CHP) deployment incentives
- Expand DOE's CHP Program, Better Plants, and Plastic Innovation Challenge
- Expand federal R&D for breakthrough technologies, such as electric steam crackers and direct air capture
- Update the definition of "recycling" used in federal programs to include biobased/compostable plastics, advanced recycling technologies and speed deployment of advanced recycling to enable use of recycled feedstocks
- Encourage end markets for recycled content, including through federal procurement standards

POINT TWO: Adopt transparent, predictable, technology- & revenue-neutral market-based, economy-wide carbon price signals

Federal carbon price signals can enable a single, transparent, effective national program to reduce GHG emissions that gradually eliminates the need for a patchwork of state laws and federal regulations.

ACC believes a carbon price signal can effectively help reduce emissions in an economy-wide way. Multiple members of Congress and Congressional Committees, the Biden Administration, many companies and industry representatives are debating the best approaches to this challenge.

ACC calls for any legislation that places a price on carbon to adhere to the following principles to ensure the business of chemistry remains competitive:

- The approach should be market-based, economy wide and only applicable to quantifiable GHG emissions
- Price signals should be revenue-neutral
- Border adjustment measures are needed to prevent carbon leakage from one region or country to another
- Feedstocks should be exempted
- A portion of collected funds should support a smooth transition to new low emissions technologies by the industrial sector
- Carbon pricing should displace performance standards and preempt state climate laws
- All sectors and sources should be included to maximize impact and reduce bias
- Product life-cycle emissions should be measured to help ensure the processes or products ***that actually enable the greatest climate progress*** are recognized
- Year-over-year reduction goals should be set using the best available science and allow reasonable time for industry to transition to new technologies and energy sources
- The system should provide credit for mitigation and adaptation strategies
- Credit should be given to early movers and adopters
- Complexity and administrative costs should be minimized
- The system should encourage measurement of the life-cycle emission benefits of products

What is carbon leakage and why is it important?

Carbon leakage occurs when activities like manufacturing and related emissions relocate to less regulated regions. In 2020 ACC developed carbon leakage principles. In sum:

- Without protection from carbon leakage, climate policy, including carbon pricing, could harm U.S. manufacturers without achieving actual emissions reductions
- Unilateral or protectionist measures or excessive government intervention in the marketplace should be avoided
- Policy should include environmental, economic and trade impact assessments

Why should feedstocks be exempted?

The chemical industry relies on natural gas, natural gas liquids and other carbon-containing materials as raw materials, or feedstocks. The carbon inside these feedstocks and embedded in the products we manufacture is not a source of GHG emissions. Any legislation should acknowledge this by exempting feedstocks from the pricing program, or by providing a rebate for the amount of carbon that is embedded in the end product. Any pricing system should not result in the carbon inside feedstocks used by chemical manufacturers being subjected to a price twice – once when it is produced upstream, and again because it is embedded in a chemical product.

POINT THREE: Encourage adoption of emissions-avoiding solutions & technologies to reduce emissions throughout the economy to achieve significant emissions savings.

Meeting the world's climate goals will not be possible without the chemical industry and the thousands of energy- and emissions-saving materials and technologies the industry's products enable. Because the chemical industry is at the top of the supply chain, creating ingredients and components needed for 96% of manufactured goods and driving 25% of US GDP, a strong chemical industry is also critical to America's future economy

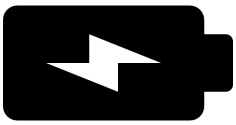
To encourage climate progress and American industry ACC calls on Congress to:

- Increase federal funding to encourage the private-sector to improve building energy efficiency
    - Increase funding for DOE's Building Energy Codes Program and Building Technologies Office
    - Make the U.S. Government more energy efficient by codifying federal efficiency goals and mandatory efficiency requirements for federal buildings
    - Support provisions of the Energy Savings and Industrial Competitiveness Act that were not included in the final 2020 energy bill including:
        - *Sec. 101*, which established new voluntary federal energy efficiency building codes and provided policy incentives for states to enact their own energy-efficient building codes
        - *Sec. 102*, creating grants for code adoption and training
        - *Sec. 103*, which provides information sharing across federal agencies relating to energy consumption information in commercial buildings
    - Enforce *Sec. 481*, PL 110-140 which requires federally-backed residential mortgages to meet recent energy code requirements
- Provide programs to build and retrofit homes and buildings with the latest energy efficiency solutions
    - Temporarily extend and expand Section 25C and Section 45L tax credits to promote energy efficient construction and home energy efficiency retrofits in a technology-neutral manner.
    - Simplify the cost recovery for energy-efficient building improvements by enacting the E-QUIP Act and/or enhancing the Section 179D tax deduction.
    - Promote the building envelope and thermal sealing in new and old buildings
    - Provide assistance for energy efficient retrofits of small- and medium-sized commercial buildings
- Encourage deployment of next-generation automobiles and associated infrastructure, with an emphasis on domestic manufacturing of components
    - Clean transportation infrastructure buildout (electricity, biofuels, etc.)
    - Policies that encourage the purchase of newer, more efficient vehicles
    - Policies and programs that continuously explore opportunities to reduce transportation-related emissions and improve fuel economy
- Implement the American Innovation and Manufacturing (AIM) Act to lock in hydrofluorocarbon (HFC) phasedowns, and ratify the Kigali Amendment to increase access to export markets for domestic manufacturers of next-generation refrigerants
- Enact measures to speed the transition to newer, more efficient appliances
- Invest in end-of-life technologies and systems that maintain the value of construction and demolition material after use

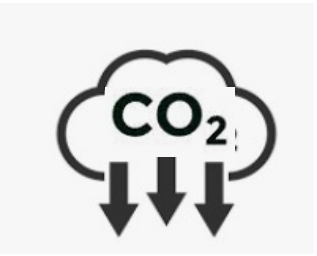
From Manufacturing to Modern Life
Chemistry is fighting climate change and enabling a strong, lower-emissions future

KEY TECHNOLOGIES TO LOWER CHEMICAL INDUSTRY EMISSIONS

Nuclear Energy. The U.S. benefits from a fleet of 96 nuclear reactors in 29 states, generating about 20% of the nation's electricity. Despite this large fleet of carbon-free energy—the U.S. generates more than any country—nuclear power has not gained meaningful U.S. electricity market share in the past 30 years. Cost, technology, licensing, and other regulatory barriers are preventing investment in new nuclear power plants. Advanced nuclear technologies have significant potential, but those too are years away from deployment.



Advanced Batteries. By the end of 2018, 869 MW of battery storage existed in the United States. While batteries can be powered by multiple different chemistries – including lead acid, nickel and sodium –the dominant battery storage chemistry is lithium-ion. Batteries are essential to managing load and providing backup power, particularly in situations where intermittent power is being relied upon. The battery industry faces major supply chain challenges: many critical components of batteries are manufactured outside the U.S., and those looking to manufacture domestically are facing significant regulatory barriers. The lack of a domestic supply chain could be an obstacle as battery demand increases and regulatory challenges hinder its development. At the same time, developing effective end of life strategies to promote recycling of the valuable materials that remain inside batteries, will be important to maximize the opportunities advanced batteries provide.



Direct Air Capture. According to the International Energy Agency, there are 15 direct air capture plants operating worldwide, capturing 9,000t/ CO_2 per year. The world's first large-scale commercial direct air capture plant is under active development in the Southwestern U.S.; the facility will be capable of capturing 1 Mt of CO_2 and could be operational in the next few years. While this technology is very promising, considerably more investment is needed to help bring it to scale.

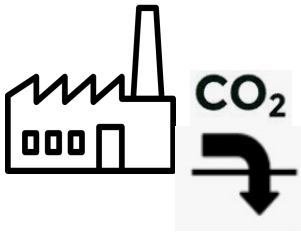
Advanced Recycling. EPA estimates that approximately 9% of produced plastic is successfully recycled. Advanced recycling can increase the amount and type of plastics that can be recycled and enable the transformation of plastic waste into feedstock that can be used in chemical manufacturing. Advanced recycling technologies with a positive sustainability footprint are an important part of the effort to address the significant challenge of unmanaged plastic waste, while also helping to meet some raw material needs for chemical producers. Life cycle assessments have shown that utilizing advanced recycling and the feedstocks these technologies produce can also potentially help reduce GHG emissions relative to some virgin feedstocks, contributing to overall carbon footprint improvements for chemical manufacturing.

Industrial Energy Efficiency Programs. Energy and process efficiency measures have led to significant GHG reductions for the chemical sector. Increased adoption along with a focus on reducing the cost of more advanced energy efficiency technologies will be critical to maximizing GHG reductions. DOE's successful Better Plants program could be a model for future efforts.

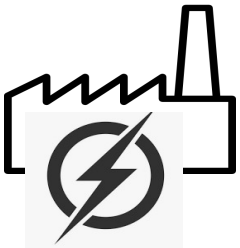
KEY TECHNOLOGIES TO LOWER CHEMICAL INDUSTRY EMISSIONS

Hydrogen Hydrogen is a clean fuel that can be used in fuel cells to generate electricity, power, or heat. Several automobile manufacturers are manufacturing hydrogen fuel cell electric vehicles in the U.S. On the industrial side, there are 161 operating stationary fuel cells at 108 facilities in the U.S., representing a total of 500 MW of generating capacity with opportunities to increase and replace greater amounts of traditional power generation. According to DOE, hydrogen and fuel cell powered CHP units could reduce emissions by 35-50% over conventional CHP units. In the vehicle sector, hydrogen and fuel cells could reduce emissions by 50-90% in light-duty vehicles, 35% in specialty vehicles, and achieve a 60% reduction in emissions compared with truck engine idling. "Blue hydrogen" can be produced from natural gas and used to generate heat, creating significant low carbon opportunity for the chemical industry as well as other heavy industries. Someday "green hydrogen," produced from renewable sources may be viable at industrial scale. Despite hydrogen's clear promise, significant market and regulatory barriers remain to deployment and adoption of hydrogen technology.

Combined heat and power (CHP). CHP represents 8% of electric capacity in the U.S. and 12% of total power generation. By producing both heat and electricity from a single fuel source, CHP offers significant energy savings and carbon emissions benefits over the separate generation of heat and power. CHP can also be combined with carbon capture and storage to virtually eliminate emissions associated with a plant's operations. U.S. manufacturing currently relies on over 1,200 industrial CHP facilities totaling about 66 GW of capacity; the U.S. Department of Energy (DOE) estimates over 73 GW of potential new capacity at over 50,000 industrial sector sites. Almost one-third of this additional potential capacity comes from the chemical sector. CHP projects, however, face a significant number of market, regulatory and business barriers that impact project cost and consumer decisions. Removing these barriers would lead to greater adoption of CHP in the chemical sector. DOE maintains a suite of resources designed to foster greater industry adoption of CHP.



Carbon capture, utilization and storage (CCUS). CCUS will be important to mitigate the carbon intensity of heavy manufacturing, including chemical production. The chemicals and petrochemical sector represent the largest source of capturable CO2 from industrial processes. CCUS can help decarbonize the production of hydrogen, ammonia, and methanol as well as high-value chemicals like ethylene, propylene, and aromatics. CCUS deployment can help advance progress on climate targets by using a decreasing the amount of CO2 emissions from stationary sources and removing CO2 from the energy system. The U.S. will need continued investment in technology and a sound regulatory and legal framework that provides the clarity and certainty to create markets and encourage private investment.



Electric Steam Crackers. Electrification of steam crackers could be transformational for the chemical sector. Today, U.S. manufacturers use fossil fuels to heat steam cracker furnaces, which results in CO_2 emissions. As electricity grids become more dependent on low or no emissions energy like renewables, electric cracking technology would allow manufacturers to draw from these clean energy sources to heat steam cracker furnaces. While this technology has garnered recent investment, it is still many years, if not decades, away from being technologically and economically feasible for wide scale use and requires significant additional research and development.

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